Risk implications of renewable support instruments: Comparative analysis of feed-in tariffs and premiums

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Comparative analysis of feed-in tariffs and premiums

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Challenge: Efficient energy policy instruments under uncertainty

To reach renewable energy targets, many European countries need a significant increase of investment in renewable energy projects. It will be private companies who will invest in most such projects and thereby in practice fulfil policy goals set by governments. It is thus essential that policy makers account for all elements that influence private investment decisions – including risk and financing issues. Support schemes based solely on cost-benefit analyses might utterly fail in providing the right investment incentives – as very different support levels may be required for different risk exposures.

Recently emerging research on this topic does not yet include socio-economic analyses regarding the impact on required total support cost. This research gap is targeted here by a combined analysis of impacts on private investors and society.

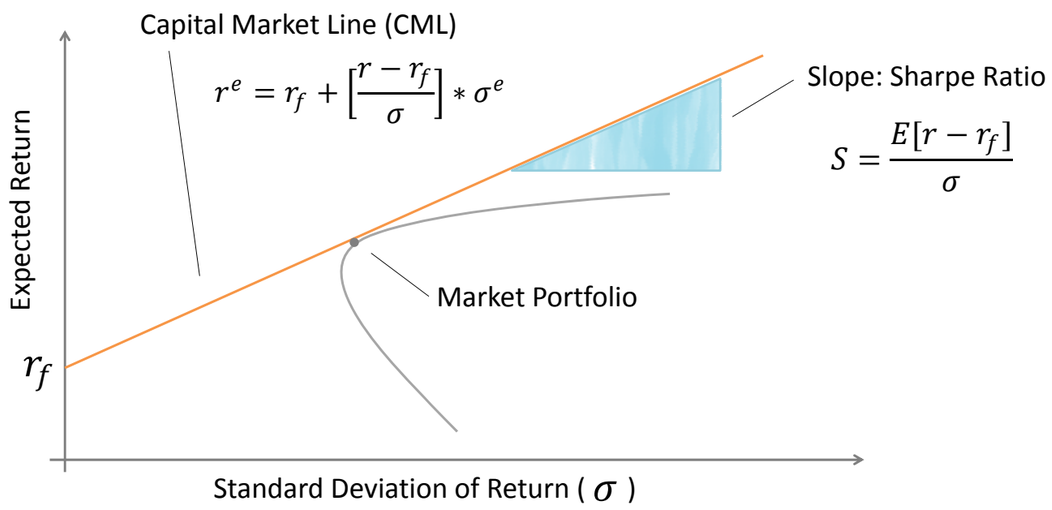
Research interest:

What effect on total support cost does it have when a policy instrument exposes investors to more market risk?

The risk exposure in this analysis stems from the uncertainty about future prices on the power market and about available wind resources.

Approach: Capital Asset Pricing Model (CAPM) and Monte Carlo

The CAPM provides a quantitative description for the risk structure of expected returns in the equilibrium (Sharpe, 1964). Merton (1980) shows that the equilibrium tradeoff between risk and return can be expressed through the Capital Market Line.



The Sharpe Ratio measures how well the return of an asset compensates the investor for the risk taken. For any risk-averse investor, investment opportunities with the same Sharpe Ratio should be equally attractive. This leads us to the following set-up of the analysis: At a given feed-in tariff, we find the corresponding feed-in premium so that the Sharpe Ratio, and therewith the investment incentive of the support scheme, remains the same.

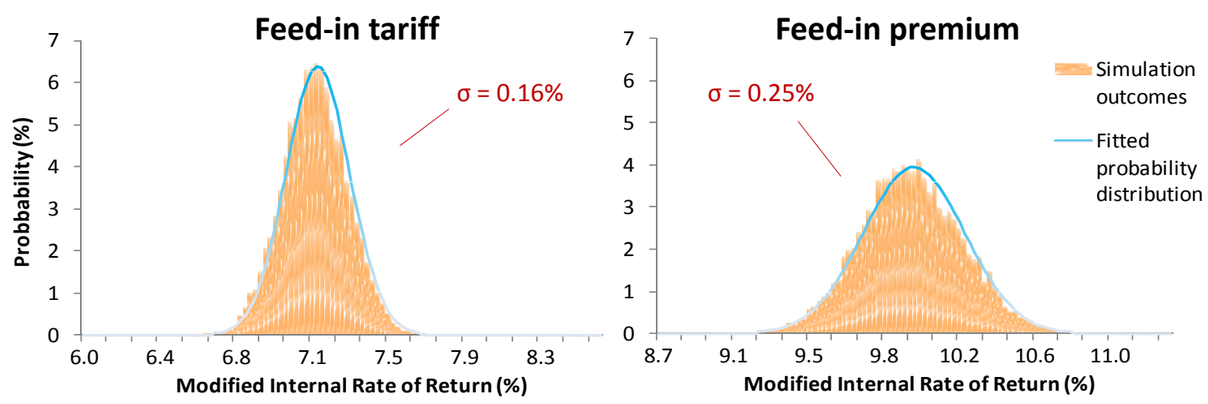
Using Monte Carlo simulations, the expected returns and the corresponding standard deviations under different scenarios are determined and then compared for the matching levels of feed-in tariffs and premiums at the same Sharpe Ratio.

CASE: Generic offshore wind park in Denmark

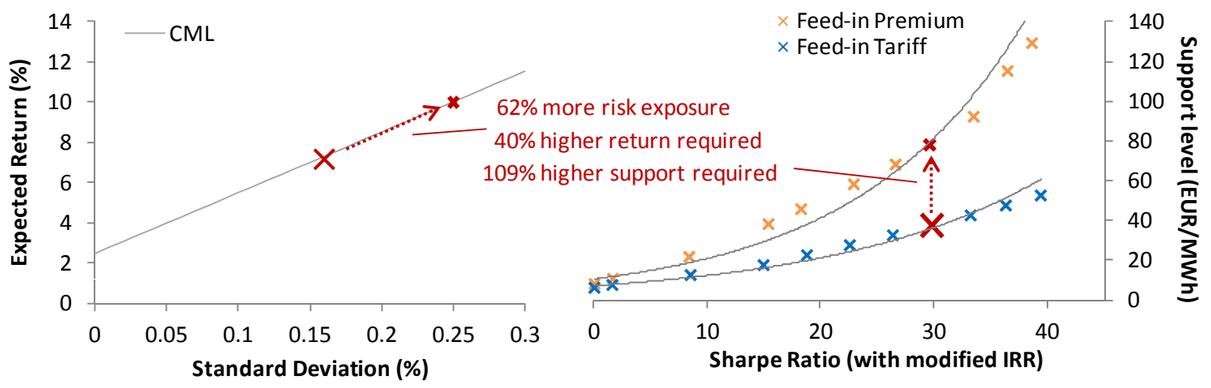
We investigate a generic offshore wind park, assuming the average of 11 installed offshore wind parks in regards to cost and production (ENS, 2012). We assume a support scheme similar to what is given to the operating Danish offshore wind park Rødsand 2, which is a tendered feed-in tariff at 84 EUR/MWh for the first 10 TWh. We model the market uncertainty according to historic data on the Danish market, where annual power prices achieved by wind parks vary with 23% and offshore wind production with 7%.

Results: Feed-in Premiums require higher support levels

In the investigated case, the feed-in tariff provides MIRR=7.16% with σ=0.16%. A feed-in premium scheme would for the same Sharpe Ratio require an MIRR of 9.97%, as investors experience with σ=0.25% a significant higher exposure to market risk.



The shift along the the Capital Market Line can only be achieved by a higher support level paid to the investor. The 40% higher expected return makes in our case an increase of 109% in support necessary, from 37 EUR/MWh (feed-in tariff less average market price) to 78 EUR/MWh (fixed premium).



Conclusions: Significant impact from exposure to market risk

The exposure to additional market risk leads to a significant increase in expected return for a risk-averse investor if the investment incentive should be kept at the same level. Policy support instruments that expose investors to more market risk, such as premiums in comparison to feed-in tariffs require therefore a higher level of support to meet the higher expected return required to maintain the investment attractiveness.

Policy makers should consider risk implications of support instruments in the same way as investors do.

Such risk implications should become an integrated part of policy decision making in order to correctly predict the effects of support instruments on private investment decisions and to ensure an effective and cost-efficient deployment of renewable energies.

References

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